Fournier's Gangrene in Elderly Patients

Ssu-Ming Huang[1], Hsi-Hsien Hsu[2]*

[1]*Division of Colon and Rectal Surgery, Department of Surgery, China Medical University Hospital, Taichung, and*
[2]*Division of Colon and Rectal Surgery, Department of Surgery, Mackay Memorial Hospital, Taipei, Taiwan.*

SUMMARY

The population of elderly individuals is growing at an accelerating rate in Taiwan, similar to other industrialized countries in the world. More elderly people are being treated in hospital. The clinical characteristics of Fournier's gangrene in the elderly (atypical symptoms) differ substantially compared with younger patients (typical symptoms), and the severity is strongly associated with increased age and age-related comorbidities. Underlying comorbid conditions have to be treated concurrently for overall effective management. Early recognition and prompt management are crucial for elderly patients succumbing to Fournier's gangrene. Surgical debridement has remained the cornerstone of treatment in current clinical practice. [International Journal of Gerontology 2008; 2(2): 48–54]

Key Words: aging, necrotizing fasciitis

Introduction

In 1883, Jean Alfred Fournier[1] described an idiopathic rapidly progressing necrotizing fasciitis of the penis and scrotum in five young males. This synergistic necrotizing fasciitis of the perineal, genital or perianal regions was actually first described by Baurienne in 1764[2]. Since Fournier's discovery, this disease has been found to affect not only young males but also all ages from newborn to elderly patients in modern medical practice[3,4]. In the study of Stephens et al.[5], the average age of the patients increased from 40 years historically to 50 years after 1979. Even in present clinical practice, a mortality rate of up to 50%[6,7] in Fournier's gangrene (FG) still remains a serious concern. Some studies[8–10] have revealed that patients with FG who are older than 60 years have a higher mortality rate compared with patients with FG who are younger than 60 years (50% mortality after 60 years). In this article, we review the etiology, associated conditions, manifestation, diagnosis, management and prognosis in elderly patients with FG.

Etiology and Associated Conditions

In a review article of 1,726 cases by Eke[11] in 2000, the causes of FG included dermatologic (24%), colorectal (21%), genitourologic (19%) and idiopathic (36%) sources. Most other review articles have observed similar results[12–15]. Common dermatologic causes include elective skin surgical procedures, skin abscesses, and pressure sores[2]. Frequent colorectal etiologies include anorectal infections, ischiorectal abscesses, colon perforations, and some routine anorectal procedures (rectal biopsy, anal dilatation or hemorrhoidal banding)[2,16–19]. Commonly reported genitourologic conditions include urethral stricture, trauma from an indwelling Foley catheter, urethral calculi, and prostate biopsy[2]. In women, Bartholin abscesses and vulval skin infections are the most commonly reported causes of FG[20]. Although improved diagnostic tools have often demonstrated an underlying etiology, a number of cases of idiopathic origin still play a significant role in the pathogenesis of FG[5,11,21]. In cases when an infection source cannot be readily identified, a surgeon should further investigate the

Correspondence to: Dr Hsi-Hsien Hsu, Division of Colon and Rectal Surgery, Department of Surgery, Mackay Memorial Hospital, 92, Section 2, Chung-San North Road, Taipei, Taiwan.
E-mail: hsu5936@ms3.hinet.net
Accepted: March 15, 2008

patient's abdomen, because an infection from the abdomen (diverticulitis, appendicitis, colon cancer, Crohn's disease, etc.)[22–26] would significantly influence subsequent treatment.

Despite varying etiologies, patients with FG are usually observed to have a comorbid condition such as diabetes mellitus (DM; 10–60% of cases)[27], alcoholism, immunosuppression (chemotherapy, steroids or post-transplantation), leukemia or human immunodeficiency virus infection. The possible mechanisms of DM patients predisposing to FG include a higher number of bacteria on the skin surface, defective phagocytosis, DM neuropathy-induced bladder outlet obstruction with subsequent urinary tract infection, and angiopathy-induced tissue ischemia in infected areas[28]. Reported occurrences of DM in patients with FG were 32%, 66% and 50% in the studies of Clayton et al.[4], Hejase et al.[17] and Smith et al.[2], respectively. The link between alcoholism and FG was immunosuppression and poor hygiene. Reported occurrences of alcoholism in FG were 51%, 66% and 40% in the studies of Clayton et al.[4], Hejase et al.[17], and Smith et al.[2], respectively. In addition, malnutrition and low socioeconomic status are also associated with FG[29]. Filariasis has also been described as a cause in some endemic areas[30]. Other conditions associated with FG include prolonged hospitalization, malignancy, and intravenous drug use[2]. All these associated conditions and comorbidities result in varying degrees of immunosuppression. The common feature in all these comorbid conditions is decreased host resistance from cellular immunity[28].

In Taiwan, about 9.6% of the population is 65 years of age or older[31]. The population demographics of Taiwan are shifting to an increased proportion of the elderly. By the year 2020, over 14% of the Taiwanese population will probably fall into this age range[31]. There is clear evidence that elderly patients experience a significantly increased incidence of severe sepsis from infection[32]. Infection in elderly patients usually has a high mortality and morbidity rate in spite of modern medical care. Factors predisposing the elderly to infection include diminishing immunity, inadequate social support, underlying comorbid situations, and physiologic changes that accompany aging (e.g., malnutrition, poor circulation). Although Franceschi et al.[33] believed that healthy elderly subjects could have strong immune responses, the diminishing immune system likely plays a crucial role in the vulnerability of the elderly to infections such as FG. On the other hand, many factors also increase the risk of FG in the elderly and are not necessarily associated with diminishing immunity. The elderly usually exhibit atypical symptoms compared with younger patients, making immediate and accurate diagnosis difficult. Furthermore, coexisting chronic illnesses (congestive heart failure, DM) in the elderly may also distort the typical symptoms of FG. Fever may also be delayed in the elderly. Jarrett et al.[34] compared demented and dependent patients with nondemented and independent counterparts, concluding that the former group was likely to have more complicated hospital stays and exhibit confusion, delirium and dehydration.

Manifestation

Clinical observations of FG showed male predominance and a mean age of more than 50 years[35]. The described manifestation of FG is extremely variable. Clayton et al.[4] reported that scrotal swelling and smelly odors were noted in all their 57 patients with FG of the male genitalia. Fever and hyperemia were noted in 15% and 26% of their patients, respectively. In the series of Baskin et al.[19], they described pain or swelling in 100% of the patients, fever in 19%, crepitus in 18%, skin necrosis in 10%, shock in 4% and delirium in 3%. Other cutaneous manifestations consisted of cyanosis, bronzing, blistering, and induration[36]. In summary, local symptomatic manifestations are consistent with FG. However, systemic symptoms are not necessarily consistent with FG.

Involved areas of FG may vary. In the study of Benizri et al.[18], involvement of the scrotum and penis occurred in 50% and the perineum in 46% of FG patients. Locally involved areas of FG were frequently reported to include the abdominal wall, thorax, and extremities. Although the original description emphasized an abrupt onset, FG may present in an insidious way, especially in the elderly[37]. FG usually initially presents with perineal or perianal pain. The infective process of FG results in subcutaneous blood vascular thromboembolization, which consequently leads to skin gangrene. However, once gangrene is established, pain is often diminished. Afflicted individuals may have fever and general fatigue for several days. Other signs and symptoms include nonspecific abdominal pain, general symptoms of nonspecific infection, and septic signs. The clinical picture becomes much clearer with worsening of cutaneous inflammation and skin necrosis. Crepitus is usually found on physical examination because of gas-forming

bacteria within the infected bed. It is important for physicians to recognize FG at an earlier stage, because the cutaneous manifestation of FG has been likened to "the tip of the iceberg" and it may present with trivial cutaneous manifestation of the underlying severe infection. Acute renal failure, acute respiratory distress syndrome, pneumonia, intestinal bleeding, and heart failure are the most commonly described systemic complications[38,39]. Progression to single or multiorgan failure may occur and is the usual cause of mortality[36].

Diagnosis

Diagnosis is usually based primarily on clinical grounds. With thorough clinical examination, the origin of the infectious process can usually be found. Because delay in treatment has a significant impact on poorer prognosis, radiologic evaluation in equivocal cases can be used to accelerate the diagnostic process somewhat[9,40]. The extent of disease can be investigated by abdominal echogram, computed tomography (CT) scan or magnetic resonance imaging[41]. Amendola et al.[42] concluded that a preoperative CT scan is not essential in all patients suspected to be infected with FG. However, when the underlying infectious source is not clear, CT scans may identify a retroperitoneal or intra-abdominal origin. Plain film of the abdomen is also a useful tool[43]. A plain film may demonstrate air in soft tissues. Although air in soft tissues is not pathognomonic, it would alert surgeons to the possibility of FG.

Occasionally, the diagnosis of FG must be well differentiated from other acute scrotal conditions, such as strangulated inguinoscrotal hernias, strangulated Richter's hernia, scrotal abscesses and scrotal cellulites[2,29]. Some studies[43–46] reported the discovery of subcutaneous air by scrotal sonogram prior to crepitus appearance, so scrotal sonograms have been used for years in the diagnosis of FG. Scrotal sonograms can help distinguish FG from intrascrotal pathology where scrotal pain, erythema, and swelling are commonly seen.

Most laboratory findings resulting from sepsis, and not specific to FG, include thrombocytopenia, hyperglycemia, leukocytosis and anemia[43]. However, hypocalcemia due to bacteria lipase is thought to be an important indicator of the early stage of FG[47]. The interval between initial presentation and final diagnosis was reported to be 7.4 days in the series of Benizri et al.[18] and 4 days in the series of Lacran et al.[48]. This long interval between presentation and diagnosis was thought to be indicative of poor prognosis. Smith et al.[2] suggested that the following two situations, when encountered, should increase the likelihood of FG: (1) when infectious processes do not respond well to antibiotics; and (2) when septic symptoms appear disproportionate to scrotal cutaneous manifestations in the early stage of infection.

Assessment of FG should also be focused on identifying underlying comorbid diseases to make treatment more effective. As a result, the following examinations are recommended to exclude malignancies: urinalysis and culture, retrograde urethrography, proctoscopy, and biopsy[18,38]. Paty and Smith[49] particularly emphasized the role of retrograde urethrography and proctoscopy. Preoperative proctoscopy is crucial in determining whether to create a diverting stomy or not. Similarly, a retrograde urethrogram may confirm the need for suprapubic diversion if massive contrast extravasation is found during examination. A retrograde urethrogram should be obtained in all cases of FG preoperatively or intraoperatively. A urinary tract imaging study and cystoscopy should be undertaken to identify a possible source from genitourologic infection.

A bacteriologic examination with thorough screening to identify the likely septic source is also necessary. Biopsy of the involved tissue rarely helps the diagnosis of FG, because the pathology always depicts nonspecific findings such as dermal necrosis, thrombosis, and subcutaneous tissue necrosis[49]. In the study of Paty and Smith[49], the gangrene has been estimated to proceed at a rate of 2.5 cm per hour, so it is recommended not to spend much time on performing too many investigations on severely ill or elderly patients.

Management

The principles of management are hemodynamic stability, broad-spectrum antibiotics for all suspected involved bacteria, careful treatment of underlying comorbidities, and prompt debridement. Immediate surgical debridement is the most important and effective treatment.

Supportive methods

Aggressive, urgent intravenous fluid (crystalloid, colloid or blood) resuscitation and careful correction of electrolyte imbalance should be initiated immediately[27].

Critical care principles should be applied to patients with FG. Adequate calorie and protein intake must be ensured to support wound healing after surgical debridement. Because parenteral nutrition may have serious side effects, enteral feeding is preferred. Blood and clotting factors may also be required. If FG is suspected, it is necessary to explore surgically as early as possible.

Antibiotics

Because a mixture of microorganisms is usually found in FG patients, triple-coverage broad-spectrum antibiotics (penicillin for streptococcal species, metronidazole or clindamycin for anaerobes, and third-generation cephalosporins or aminoglycosides for Gram-negative aerobes) are usually recommended immediately before culture results and sensitivities are obtained[30]. High doses of antibiotics must be administered immediately before surgery.

Local wound care agents

Some authors described local application of povidone-iodine, sodium hypochlorite or hydrogen peroxide for postoperative wound treatment[17,49]. Naturally unprocessed honey can also be useful in postoperative wound care, providing a promising acceleration of healing. The hypothesized mechanism of unprocessed honey as a treatment includes production of oxygen, fluid absorption, digestion of dead and necrotic tissue by enzymes in the honey, cessation of the necrotic process, and promotion of epithelial growth at the wound edges[17]. Unprocessed honey also contains antimicrobial agents. Both Efem[29] and Hejase et al.[17] enthusiastically recommended the role of unprocessed honey. However, further studies should be conducted to confirm the usefulness of this agent.

Surgical management

FG has remained a surgical emergency even today, as the infectious process can proceed rapidly within hours. Ever since Meleney introduced debridement in patients with FG in 1920s, this has remained the basis of management of FG[11]. The patient should be put in the lithotomy position, because this allows ready access to all perineal structures. Laucks[43] suggested that if a perineal source is not found, physicians should suspect an abdominal origin; in addition, exploratory laparotomy should be considered. Minimally invasive laparoscopy can also be considered as an adjunctive tool.

If necrotic testicles are found during debridement, an intra-abdominal process, which leads to thrombosis of the testicular artery, should be strongly suspected. As testicles receive their blood supply from an abdominal origin (nonperineal blood supply), the testicles are always spared if disease affects the subcutaneous tissue only[23].

The goal of debridement is to remove all devitalized tissues and prevent the infectious process from spreading. Mere drainage of necrotic tissue without debridement is associated with a very high mortality[50]. Laucks[43] suggested excising tissue along the fascia planes until viable tissue is encountered. However, because deep fascia and muscle are rarely involved, it is usually not essential to debride these areas. Because it is relatively easy to separate diseased fascia from the underlying healthy layers, this might help determine the extent of excision. Surgeons always need to remove a large portion of necrotic sites and leave a huge open wound to meet the aforementioned criteria.

Although aggressive and prompt debridement results in fewer repeated operations, repeated debridements are frequently needed, with an average of two to four debridements per patient[19,38] to eradicate all remaining infection sources due to the infiltrating nature of FG[12,19]. After initial debridement, the wound must be carefully monitored. If there is any doubt about tissue viability, secondary exploration should be performed 24–48 hours after the initial debridement to exclude ongoing necrosis. This is particularly crucial while the patient's systemic situation has not been ameliorated after initial debridement. If the septic signs do not improve after the initial debridement, a missed intra- or retroperitoneal source must be considered.

The use of fecal diversion or urinary diversion has remained controversial. In the study of Caird et al.[51], most patients would preserve their testes and rectum. Most cases would not require a concomitant diverting colostomy; however, when extensive perineal debridement is required or when gross sphincter infection or rectal/colon perforation is present, many authors suggest that it is essential to create a diverting colostomy[14,18].

Similarly, when there is urine extravasation or periurethral inflammation, urinary diversion may be considered[49]. This can usually be accomplished using a Foley catheter. However, when urethra outflow obstruction is present, suprapubic cystostomy is required[17,38,52]. On the other hand, many authors emphasize the risk of infection associated with urinary drainage, recommending

urinary diversion be limited only to perineal gangrene of urologic origin[35].

After adequate debridement, daily dressing changes are needed to further remove any nonviable tissues forming subsequently. Debridement may leave large skin defects. Once the infection is cleared, wound healing usually occurs without the need for reconstructive surgery procedures. However, a split thickness skin graft or other reconstructive procedures are sometimes needed to cover large defects to prevent non-healing or wound retraction[10]. The split thickness skin graft is the most commonly used measure in current practice[17,49].

Hyperbaric oxygen (HBO) therapy

In 1941, Ozrio De Almeida and Pecheco first suggested the utilization of HBO[18]. Although HBO therapy is still controversial, it has been regarded as an effective adjuvant therapy in some patients[53]. It reduces systemic toxicity and stops extension of necrotizing infection, thus improving the outcome of patients. The postulated mechanism is that HBO would exert an effect against both clostridial and non-clostridial infections after release of oxygen free radicals (peroxide and superoxide)[10,12,54]. However, this suggestion has not been confirmed in large randomized controlled trials. In addition, HBO accelerates the phagocytic function of neutrophils and consequently controls the infectious process. HBO exerts beneficial effects on wounds by accelerating angiogenesis and fibroblast proliferation[53]. HBO also reduces edema by vasoconstriction and increases intracellular transport of antibiotics. On the other hand, HBO therapy did not provide significant benefits according to other authors in terms of mortality and morbidity rates[14,15,17,55–57]. Even though some authors support the role of HBO in FG, HBO should not delay or replace the role of definitive surgical debridement.

Prognosis

The mortality rate of patients with FG has been observed to be 14–45%, with an average of 26% in published reports[14]. In spite of modern medical measures, the reported mortality rate is still over 40% in many studies[2,52]. The high mortality implies the aggressive nature of the infection and the underlying debilitating situations. Moreover, in elderly patients, the mortality is even higher. Some studies[8–10] showed that patients older than 60 years have a higher mortality rate compared with those who are younger than 60 years (50% mortality in patients over 60 years).

In immunocompromised patients, the mortality was also demonstrated to be higher[58,59]. Although DM is frequently regarded as increasing mortality in FG, the definitive relationship between underlying DM and prognosis is still controversial[60]. Elliot et al.[9] demonstrated that only when DM was associated with renal dysfunction or vascular impairment would it predispose patients with FG to death.

Several negative prognostic factors were identified, including advanced age[4,7,18,19,43], primary anorectal infections[19,61], extensive involvement[4], sepsis[18], positive blood culture[18], female gender[9], and delayed presentation and treatment[61]. Debilitation and abnormal homeostasis were also associated with unfavorable outcomes[2,61]. Despite conflicting views, the extent of local disease is not a negative predictor of FG[7]. Laor et al.[7] has designed an FG severity index to identify prognostic factors, and they found, as noted in other studies[62,63], that abnormal homeostasis was the most important parameter predictive of outcome and not the extent of disease or performance of surgical debridement.

Outcomes are primarily influenced by the timing and adequacy of surgical debridement. Early aggressive management is associated with a reduced mortality rate. Reduction of mortality rate is not attributable to antibiotics. Hospitalization is always prolonged with a mean stay of 6 weeks.

Conclusion

FG is an aggressive synergistic fasciitis of the perineum. It is commonly seen in elderly or debilitated patients. This disease is no longer considered idiopathic, as an origin can usually be identified. A perianal source is now the most common cause of FG. Even with improved medical care, mortality from FG remains high, particularly among the elderly. This epidemiologic feature probably results from an increasing proportion of elderly individuals and an increasing prevalence of high-risk comorbidities including diabetes, alcoholism, immunosuppression, and debilitation.

Imaging modalities can be performed in delineating the extent of the disease preoperatively in questionable cases. The principles of management are aggressive surgical debridement (even repeated debridements if clinically indicated), broad-spectrum antibiotics,

nutritional supplementation, and intensive care. Prompt surgical extirpation of all nonviable tissue remains the most important treatment for patients with FG.

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